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DANA DEAN



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April 17, 2010

Nedzlene Ferrario
Solano County Department of Resource Management
675 Texas Street, Ste 5500
Fairfield, California 94533

Sent Electronically and Via US Mail

Re: Permit Application U-09-3
Applicant: C6 Resources LLC

Dear Ms. Ferrario:

Please recall that this office represents C6 Resources LLC in matters related to the above referenced Use Permit application for a Small Scale CO₂ Reduction Project in unincorporated Solano County. This correspondence is sent in response to your letter to DaMonica Pierson, dated March 17, 2010, in which you requested additional information related to the processing of our application.

Regarding Requests Related to Noise Analysis (Items 3 and 4)

Drill Compressor Noise

There are no compressors associated with the drill rig that would create noise of any substance. No compressors would be required on-site during CO₂ injection, as the CO₂ arrives and is stored in a compressed state. As discussed in the Initial Study, the limited noise from the *total* drilling operations is not expected to impact residents, primarily because of distance and topography. (See Initial Study, p. 52.)

Truck Noise

In response to your request for an evaluation that includes decibel levels from trucks traveling at 55 mph, please accept the revised text set out below and in the replacement page attached. Revisions are shown in underline/~~strikeout~~. You will note that the additional information does not change the conclusion that no mitigation is required, because the noise expected to be generated at the greater rate of speed still falls within acceptable levels.

The Solano County Public Health and Safety element of the General Plan has Land Use Compatibility Standards of 45 dBA CNEL¹ for the interiors of residential uses. Because of the noise barrier provided by building walls and windows, the rule of thumb is that the interior of residences will be about 15 dBA lower than the noise outside the residence. Based on this difference, exterior noises of 55 to 60 dBA would be 40-45 dBA inside the residence. Stated another way, exterior noise of 60 dBA would meet the General Plan objective of 45 dBA for interior noise levels in residential uses.²

~~Gravel trucks associated with the project would have a CNEL of 44 dBA. Trucks delivering gravel would operate during the daytime for approximately a week. The highest single hour noise levels from these trucks, travelling 40 miles per hour, would be about 59 dBA at the exterior of a building located 50 feet from the source. Taking into account the shielding provided by walls and windows, this would be about 44 dBA in the interior of the residence. This assumes some background noise from existing traffic; however, data on existing traffic are unavailable.~~

~~CO₂ delivery trucks would have a CNEL of 41 dBA. Trucks delivering CO₂ would generate a similar noise level as gravel trucks, about 56 dBA CNEL measured at the exterior of the building. CO₂ is expected to be delivered around the clock, at the rate of about ten round trips per 24-hour day. This would be 20 truck passes of a point per day — or about one per hour. Half would be loaded, half would be empty. For nighttime noise, which is more disruptive of sleep and evening/morning activities, a penalty of 10 dBA is added to actual nighttime noise levels. That penalty has been applied to the CO₂ delivery calculations here.~~

Gravel trucks associated with the project would operate during daytime hours for approximately one week. At a residence 35 feet from Birds Landing Road, this could result in an indoor CNEL ranging from 45 to 47 dBA, depending on truck speed. For trucks travelling 40 miles per hour, the highest single hour noise levels at this building would be about 60 dBA at the exterior and 45 dBA in the interior. For trucks traveling at 55 mph, this would result in a daytime single hour noise level of about 62 dBA at the exterior and 47 dBA in the interior.

¹ Community Noise Equivalent Level (CNEL) measurements are a weighted average of sound levels gathered throughout a 24-hour period.

² CNEL is essentially a measure of ambient noise. Different weighting factors apply to day, evening, and nighttime periods. This recognizes that community members are most sensitive to noise in late night hours and are more sensitive during evening hours than in daytime hours. CNEL depends not only on the noise level of individual approaches, but also on the number of approaches during the measurement period.

CO₂ is expected to be delivered around the clock for a month, at the rate of about ten round trips per 24-hour day. This would result in 20 truck passes of a point per day – or about one per hour. Half of the trucks would be loaded; the other half would be empty. As nighttime noise is identified as more disruptive of sleep and evening/early morning activities, a penalty of 10 dBA is added to actual nighttime noise levels to account for this effect. This penalty is applicable to nighttime trips and has been taken into account in the CO₂ delivery calculations here. CO₂ delivery trucks would have a CNEL of up to 45 dBA experienced indoors at a building 35 feet from the source. Depending on truck speed, this would be up to 60 dBA CNEL measured at the exterior of the building.

Based on the noise levels for day and night, and the fact that the anticipated noise levels would occur for a short period, no mitigation is required.

Regarding Requests Related to Costs (Item 5)

Our previous submission included a line for “reclamation” of the site, which was intended to address restoration. The estimated cost is \$61,000.00. In terms of a timeline for restoration, we project this work would begin upon the direction from the property owner and take a minimum of 30 days to complete.

Regarding the Choice of the Subject Site (Item 7)

An evaluation of the southern Sacramento Basin was carried out in 2007 to identify potential CCS opportunities. The evaluation focused on subsurface parameters pertaining to Injectivity, Capacity, and Containment of a potential CCS site.

Injectivity was assessed by measuring the following key parameters:

1. Thickness of the prospective reservoir(s)
2. Permeability
3. Rock fracture pressure, and
4. Pore pressure

Capacity assessment focused on:

1. Reservoir properties such as porosity, thicknesses and heterogeneity, as well as,

2. The potential of the reservoir(s) to effectively accommodate CO₂ via the processes of residual solution trapping, dissolution trapping (salinity, temperature and pressure) and/or mineralization trapping.

Containment effectiveness of a potential CCS site focused on avoiding leakage by assessing:

1. The presence/absence of a proven trap
2. Presence/absence of proven top seal(s) that is regionally extensive
3. Proximity to faults and fractures (ie. structural complexity in the vicinity of the CCS site)
4. Number and location of existing wells in and around the potential CCS site.

In comparing sites within the region, Montezuma Hills presented clear advantages. As a syncline east of the Kirby Hills fault zone, it is relatively structurally undeformed with multiple continuous sandstones and shales providing adequate storage capacity and containment. The terrain is favorable with respect to environmental sensitivity and land access, is close to existing pipeline infrastructure and has very few well penetrations.

Regarding the Remaining Issues (Items 1, 2, and 6)

I would like to direct your attention the Underground Injection Control ("UIC") permit, expected to issue shortly from the US Environmental Protection Agency - Region 9 ("the EPA").

As you and I recently discussed, we anticipate that the EPA, the agency exclusively tasked under the Safe Drinking Water Act ("SDWA") with the permitting of CCS injection, will approve our UIC Class V permit application. Further, each of us has been informed by Adam Freedman, EPA Region 9, that a Draft of the UIC permit and attendant conditions of approval will be circulated to Solano County and to C6 Resources, LLC in advance of public review. The result is that Solano County will have the opportunity for early review and comment on the conditions necessary for injection to be permitted, as well as the opportunity to review the information relied on by the Agency in making its determination to permit the injection for the small scale project. It is our understanding that the draft permit will be sent to you in the very near future, likely within days.

Some of the requests for information contained in your March 17, 2010 letter relate to subjects that we believe are addressed in the UIC permit. As such, we ask that you refer to the UIC permit, as well as other relevant communications from EPA for clarification of these areas of inquiry.

At this time we believe we have produced all information necessary in order for you to issue a determination that our application is complete.

Please feel free to contact me at your convenience to discuss these matters further. Thank you for your continued consideration.

Regards,

/s/

DANA DEAN

DD/sag

Attachment/enclosure (1)



Department of Resource Management
675 Texas Street, Suite 5500
Fairfield, California 94533
www.solanocounty.com

Planning Services Division
(707) 784-6765 Fax (707) 784-4805

Mike Yankovich
Program Manager

March 17, 2010

DaMonica Pierson
Sr. Technical Advisor
Shell Exploration and Production
Upstream Americas CO2/CCS
150 N. Dairy Ashford
Houston, TX 77079

Subject: U-09-3 Northern California CO₂ Reduction Project - Incomplete

Dear Ms. Pierson:

On February 19, 2010, this department received a noise analysis, revised site plan/grading plan, a Vulnerability Evaluation Framework Review and a cost estimate for your Use Permit application U-09-13 for a Class V injection well for carbon dioxide sequestration on property located at 6378 Montezuma Hills Road (APN: 0090-090-280).

As required by section 65943 of the Government Code, you are hereby advised that the referenced application has been reviewed and found to be incomplete. In order to complete your application, the following information shall be submitted.

- 1) A preliminary seismic study, as outlined in the attached memo from the Environmental Health Division, dated September 21, 2009, and as further clarified at our meeting on November 13, 2009.
- 2) A qualitative risk assessment pursuant to EPA's Vulnerability Evaluation Framework (VEF) for carbon dioxide sequestration prepared by an independent geologist licensed to practice in the State of California. This document shall be a technical report separate from the Initial Study. In addition, include supporting facts/statements to support the conclusions.
- 3) Evaluation of the noise generated from the drill compressor and impacts to the residences.
- 4) The submitted noise analysis evaluates the decibel levels at trucks travelling at 40 mph. Because the speed limit is unposted and truck drivers may drive at 55

mph, please revise the noise analysis to include the decibel levels at 55 mph as well.

- 5) The submitted cost estimate covers the costs for construction of the pad and well. Please submit a cost estimate for closure and restoration of the site, along with a timeline for completion of this process (assuming the commercial project does not go forward).
- 6) Submit an expanded detail plan of Figure K-1 of the Class V Underground Injection Control Permit Application and Technical Report to include the anti-blowout protection equipment as recommended in our memo to you dated September 21, 2009. The blowout protection equipment shall be designed consistent with Section 3219 of the California Laws for Conservation of Petroleum & Gas.
- 7) Submit a detailed explanation as to the reasons why the subject site is an optimal location for geologic CO2 sequestration and any alternative sites that were considered.

Your application will be held as incomplete pending receipt of the information requested above. Your prompt response will greatly facilitate our department's processing of your application. During the course of consideration of the application, it may be necessary to ask you to clarify or provide additional information. We will contact you if this becomes necessary. Once the application has been deemed complete, we will determine the appropriate level of environmental review for the proposed development. If you have any questions, please do not hesitate to call me at (707) 784-3170.

Sincerely,



Nedzlene Ferrario
Senior Planner

Cc: Dana Dean
835 First Street
Benicia, CA 94510

Fritts Golden
Aspen Environmental Group
235 Montgomery Street, Suite 935
San Francisco, CA 94104



C6 Resources LLC
200 N. Dairy Ashford Dr.
P.O. Box 576
Houston TX 77001-0576
Direct line: (281) 544-4972

February 26, 2010

Ms. Nedzlene Ferrario
Solano County Planning Services Division
Dept. of Resource Management
674 Texas Street, Suite 5500
Fairfield, California 94533

**Subject: Transmittal of Northern California CO₂ Reduction Project Permit Application
Vulnerability Evaluation Framework Review**

Dear Ms. Ferrario:

C6 Resources LLC, an affiliate of Shell Oil Company, is pleased to provide five copies of our Vulnerability Evaluation Framework Review in response to Solano County's September 21, 2009 correspondence (see Attachment 1).

If there should be a need for additional information, or if there are any questions, please contact DaMonica Pierson, at 832-337-2172 or email damonica.pierson@Shell.com.

Sincerely,

A handwritten signature in black ink, which appears to read "Edward Hymes", is positioned below the "Sincerely," text.

C6 Resources LLC
Edward Hymes
President

cc w/attachments

Mr. Adam Freedman
Environmental Scientist
US EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

ATTACHMENT 1
September 21, 2009 Correspondence from Solano County



SOLANO COUNTY
Department of Resource Management
Environmental Health Division
675 Texas Street, Suite 5500
Fairfield, CA 94533
www.solanocounty.com

Telephone No: (707) 784-6765
Fax: (707) 784-4805

Birgitta Corsello, Director
Clifford Covey, Asst Director

Memorandum

DATE: September 21, 2009

TO: Michael Profant, Project Planner

FROM: Victor Chan, Environmental Engineer
Misty Kaltreider, Engineering Geologist

COPY: Terry Schmidtbauer, Environmental Health Program Manager
Jeffrey Bell, Sr. Environmental Health Specialist
Ricardo Serrano, Environmental Health Supervisor

RE: Shell Oil CO2 Injection Well Project

Project Description:

A formal project application is not submitted to Solano County at this time. Discussion of the preliminary data is presented for the installation of a Pilot CO2 Injection Well, and to determine the feasibility of large scale CO2 injection project for the purpose of CO2 sequestration

Discussion:

Victor Chan, Wayne Hamilton with Shell Oil and Adam Freeman, with US EPA Region 9 have discussed several minor, items of concern relating to the project, as part of preliminary review. The potential for the project to induce seismic activity, is the only outstanding item of concern identified, during the preliminary review of the proposed project.

The Vaca-Kirby Hills fault is approximately 1-1/2 miles from the proposed injection site. Other known faults exist near the proposed site, including, the Midland fault and Central Valley Thrust fault system. Fracture zones in the area may be subject to injection-induced seismic activity (earthquakes).

Building & Safety
David Cliche
Building Official

Planning Services
Mike Yankovich
Program Manager

Environmental
Health
Terry Schmidtbauer
Program Manager

Administrative
Services
Linda Zalesky
Office Supervisor

Public Works-
Engineering
Paul Wiese
Engineering Manager

Public Works-
Operations
Rick O'Neil
Operations Manager

To evaluate the suitability of the proposed area for CO2 injection, a seismic study should be performed, and the study should consider the potential radius of influence (which may extend beyond the plume radius), for the proposed injection site.

CO2 injection wells can induce seismic activity, although most of the induced seismic activity is generally of magnitude 3.0 earthquakes or less. The highest recorded induced seismic activity is a magnitude 5.5 (liquid waste disposal, Denver, CO, 1962). Deep well injection activities commonly affect a formation far beyond the location of the injection well(s). Thus, the radius of influence for the pressure front created by the injection practices may be even larger than the injection capacity indicates. In addition, the earthquakes may occur after injection activities are stopped, as shown by the Denver earthquakes which occurred over one year after injection activities were stopped. Finally, earthquakes may be induced in formations well below the injection formation. For these reasons, the **effective radius of influence must be examined for the injection well(s).**

Many types of tests are available to detect faulting or fractures that could lead to induced seismic activity including seismic surveys and down-hole geophysical tests as well as more traditional testing methods that may be performed within the borehole. Prior to conducting the well drilling program, a preliminary seismic survey should be conducted in the area surrounding the site to evaluate for potential faults and fracture zones that may be affected by the proposed injection. Once the survey is performed, an adequate set-back distance from identified fracture zones shall be established based on the potential radius of influence of the injection system.

The applicant shall demonstrate that there are no faults or fractures within the defined radius of influence that might be susceptible to earthquakes from the injection.

To address this potential issue, it is recommended that a preliminary seismic survey and follow-up evaluation of the effective radius of influence be performed. The seismic study will provide public assurances that the CO2 Injection Well will not cause a significant seismic event greater than a magnitude 3.0.

The Pilot CO2 Injection Well is designed to acquire data to determine the feasibility of large scale CO2 Injection. Therefore only a preliminary seismic survey should be required. If large scale CO2 Injection has been determined to be feasible, then the preliminary seismic survey must be expanded into a final report prior to large scale CO2 Injection.

Recommendation:

1. The critical elements of the preliminary seismic study for the Pilot CO2 Injection are as follows:

a. The preliminary seismic study must be performed and certified by a qualified seismic expert. The qualified seismic expert can be a professional civil engineer or a professional engineering geologist and demonstrate a qualified level of experience in seismic and geologic evaluations. The preliminary seismic study must be signed or stamped by the qualified California licensed seismic expert. The seismic expert's qualified level of experience in seismic and geological evaluations must be documented in the study.

b. The preliminary seismic survey shall include a detailed geologic surface and seismic survey to evaluate for surface and subsurface fracture zones along with verifying the subsurface structure and potential orientation of fracture zones in the general area. The study shall also include the

frequency, magnitude, and foci depth of historic seismic activity for in the area. Based on the study, then establish the potential radius of influence for the proposed CO2 injection. It should be noted that the radius of influence of the injection system may be kilometers to tens of kilometers from the injection wells.

c. The study shall review the geological and seismic information submitted in the original Use Permit application report. The qualified seismic expert must concur (or non-concur) to the original Use Permit application report which implied that the project is not likely to significantly affect the seismicity of Solano County and injecting 6,000 tons of CO2 is unlikely to induce an earthquake greater than 3.0. The basis and the rationale for this concurrence or non-concurrence must be documented.

d. The preliminary seismic study shall also determine the level of vulnerability related to Faults/fracture zones described in Chapter 3.1.1 and Chapter 5 of EPA 430-R-08-009 (Vulnerability Evaluation Framework for Geological Sequestration of Carbon Dioxide). As noted in EPA 430-R-08-009, the evaluation must preliminarily assess the vulnerability related to faults/fractures are either "low" or "elevated" for the pilot project. This assessment will be finalized for the final seismic study with supporting field data acquired during the pilot study.

e. In preparation for the final seismic study, the preliminary seismic study shall make any recommendations, if any, on the necessary seismic field data to be acquired during the pilot study. An example of the seismic data may include documentation of CO2 injection pressures, CO2 volumes and critical timelines which can be correlated to seismic activity during the CO2 injection, and extension of seismic monitoring (including laterally beyond the proposed monitoring locations, and extension of monitoring time).

2. The Use Permit conditions should include 'blowout protection equipment'. This is a standard requirement on permits issued by the California Department of Natural Resources, Division of Oil and Gas. Blowout protection equipment usually consists of a check valve to prevent reverse flow from the primary injection flow direction. This requirement will minimize the accidental release of CO2.

ATTACHMENT 2
Vulnerability Evaluation Framework Review for
the Northern California CO2 Reduction Project

PROJECT MEMORANDUM – C6 RESOURCES LLC
NORTHERN CALIFORNIA CO₂ REDUCTION PROJECT

Date: October 8, 2009
To: Wayne Hamilton
From: Fritts Golden
Subject: Vulnerability Evaluation Framework Review

Background

In 2008, the U.S. Environmental Protection Agency (EPA) published a technical support document outlining a "Vulnerability Evaluation Framework" (VEF) regarding the geologic sequestration of carbon dioxide (CO₂).¹ The VEF is to help identify conditions that could increase the potential for adverse impacts to occur from commercial-scale geologic sequestration of carbon dioxide.

As stated in the VEF, attempting to quantify risks of geologic sequestration will become more feasible as information is collected from pilot- and commercial-scale projects. The Northern California CO₂ Reduction Project (NCCRP) is a small-volume injection project with the objective of demonstrating the safety and feasibility of CO₂ storage in saline formations in the northern region of California's Central Valley. As such, many of the components identified in the VEF for commercial-scale projects do not apply or are of marginal applicability to the small-scale NCCRP.

The VEF identifies three components that could increase vulnerability to adverse impacts of a sequestration project. These include

1. Geologic sequestration system and geologic attributes,
2. Spatial area of evaluation, and
3. Potential impact categories and receptors.

Many of the concerns identified in the VEF are addressed for the NCCRP in the Class V UIC Injection Well Application (UIC permit application) submitted to EPA or the Initial Study submitted to Solano County. For that reason, most topics are briefly discussed here. Where germane, reference is made to the UIC permit application and the Initial Study.

1. Geologic Sequestration System and Geologic Attributes

The VEF characterizes the geologic sequestration system in terms of (a) the confining system, (b) the injection zone, and (c) the CO₂ stream.

(a) Confining System. The confining system is the geologic formation, or group of formations, composed of impermeable or less permeable material overlaying the injection zone. The confining system acts as a barrier to the upward flow of fluids. A variety of geologic attributes influence the potential for unanticipated migration and leakage past the confining system, including lateral extent, capillary entry pressure, permeability, travel time, wells and other artificial penetrations, faults/fracture zones/tectonic activity, and geochemical and geomechanical processes. The VEF approach for considering the confining system includes:

- **Establish presence of confining system over necessary lateral extent.**

Relationship to Project: As the NCCRP is a small-volume project, the lateral extent of the confining system is significantly greater than the geologic sequestration footprint, which would only extend over a radius of about 350 feet from the point of injection.

¹ *Vulnerability Evaluation Framework for Geologic Sequestration of Carbon Dioxide*. USEPA. July 10, 2008. EPA430-R-08-009. Available at-- http://www.epa.gov/climatechange/emissions/downloads/VEF-Technical_Document_072408.pdf

- **Evaluate physical properties of confining system.** The objectives of the project are to appraise and establish the presence of confining shales and permeable injection interval sandstones beneath the Montezuma Hills synclinal structure (Rio Vista basin). There are five potential "pairs" of strata that form confining interval/injection interval combinations beneath the injection site. They are (in stratigraphic order, shallowest to deepest): Nortonville Shale/Domengine Sandstone, Ione-Capay Shale/Hamilton Sandstone, Meganos Shale/Anderson Sandstone, Anderson Shale/Upper Martinez Sandstone, and Martinez Shale/Martinez123 Sandstone (For additional information, see Attachment G Geologic Data on Injection and Confining Zones of the UIC permit application).

Relationship to Project: Drilling and testing the wells will confirm the stratigraphy beneath the injection site, including characterizing the geologic material and the thickness of each formation. The capillary entry pressure for the NCCRP will be regulated by the UIC permit issued by EPA. The project may include cased-hole testing to further characterize the injection interval sands (see Section I.2 Cased-Hole Testing Program of the UIC permit application.)

- **Evaluate integrity of the confining system.**

Relationship to Project: No recorded wells penetrate the Confining Zone or the Injection Zone of the project within a one-mile radius of the permit area. This eliminates known potential artificial migration pathways to the surface or between formations. One-mile provides a significant buffer area and margin of safety for the project (see Attachment B Maps of Well/Area and Area of Review from the UIC permit application).

Given the relatively small quantity of CO₂ that would be injected and the limitations on capillary entry pressure stipulated in the UIC permit, it is highly unlikely that the CO₂ would migrate or that the project would compromise the integrity of the geology or result in elevated vulnerability.

The seismicity of the San Francisco Bay area is concentrated along transverse faults associated with movement of the Pacific Oceanic plate in a northward direction relative to the North American continental crustal plate. Ninety percent of the seismic events located within the project vicinity are deeper than 8 miles (13 kilometers), well below the formations of interest for the pilot test. Seismic history of the project vicinity and the region are discussed in the UIC permit application.

(b) **Injection zone.** The injection zone is a geologic formation of sufficient areal extent, thickness, porosity, and permeability to accommodate the CO₂ injection volume and injection rate. This zone is characterized by its physical capacity, injectivity, and geochemical and geomechanical processes.

- **Physical capacity.**

Relationship to Project: The Central Valley saline formations are estimated to have storage capacity of 140 to 500 gigatonnes of CO₂. This project would inject up to 6,000 tons of CO₂. This is a very small volume in relation to the target formation.

- **Injectivity.**

Relationship to Project: The injectivity of the geologic formation is unknown at this time. During the 20-day injection process, it is planned that an average of 300 hundred tons of CO₂ per day would be introduced into the formation; however, the actual rate will depend on formation characteristics. The operational factors of the injection will be reviewed and revised as well data and baseline data become available.

- **Geochemical and geomechanical processes.**

Relationship to Project: Geochemical modeling for the injection of CO₂ into brine indicates that the pH in the formation brine should not drop below a value of about pH 5.3, due to the buffering

provided by naturally occurring reactive minerals in subsurface formations (see Attachment P Monitoring Program of the UIC permit application.)

(c) Carbon Dioxide Stream. When a CO₂ stream is captured at an industrial source, it may have various impurities entrained in it. The effects of these impurities need to be considered.

Relationship to Project: The NCCRP would use a commercial or better grade (e.g., food-grade) of CO₂ from a commercial supplier. Because of the quality of the CO₂, potential adverse impacts from impurities in the CO₂ would not be expected.

2. Spatial Area of Evaluation: Geologic Sequestration Footprint

The geologic sequestration footprint is based on the size and shape of the CO₂ subsurface plume and associated pressure front associated with the plume.

Relationship to Project: The NCCRP is a small-volume project; the edge of the plume is expected to be measure about 350 of feet from the point of injection, which is over 2 miles below the surface.

3. Potential Impact Categories and Receptors.

The small-volume project is not anticipated to result in adverse impacts (see the NCCRP Initial Study.) However, unanticipated CO₂ migration or leakage, or changes in subsurface pressure could potentially cause adverse impacts to human health and welfare, the atmosphere, ecosystems, groundwater and surface water, or the geosphere. As such mitigations for the unanticipated potential risk, however slight, are incorporated into the project. (*Ibid.*)

- **Potential Human Health and Welfare.** The VEF states that the vulnerability of a population to the release of CO₂ is affected by the population's size and sensitivity to CO₂ and the proximity to and concentration of the release.

Relationship to Project: As stated in the Initial Study, the nearest sensitive receptor is one mile away from the injection site. No impacts to any sensitive receptors, including populations covered by Executive Orders, are expected.

The nearest known cultural resource is located 0.75 miles from the project site. The nearest recreational resource is located approximately 2.3 miles from the project site. No impacts to cultural resources or recreational resources are expected. See Section 3.5, Cultural Resources, and Section 3.14, Recreation, of the Initial Study.

The CO injection is not expected to preclude existing land use or subsurface activities at the site. See Section 3.9 Land Use and Planning, of the Initial Study.

- **Potential Atmospheric Impacts.** As the VEF states, releases of CO₂ from the geologic sequestration could reduce the benefits of capturing CO₂.

Relationship to Project: The project is a small-volume project to demonstrate the safety and feasibility of CO₂ storage in saline formations in the northern region of California's Central Valley. Releases of CO₂ are not expected.

- **Potential Ecosystem Impacts.**

Relationship to Project: The Initial Study (Section 3.4 Biological Resources) for the project includes an environmental review of impacts to sensitive species and legislatively protected species and concludes that all impacts would be less than significant

- **Potential Groundwater and Surface Water Impacts.**

Relationship to Project: The CO₂ injection would occur at nearly 2 miles below the potable water aquifers in the area. Additionally, the potable water aquifers and the injection formations are separated by several impervious shale formations. Any re-injection of produced brine into the storage formations would not affect potable groundwater quality. Appropriate best management practices would be incorporated in the project to minimize any impacts to surface water. See Section 3.8 Hydrology and Water Quality, in the Initial Study. See Attachment D, Maps and Cross Sections of Underground Source of Drinking Water of the UIC permit application.

- **Potential Geosphere Impacts.** As stated in the VEF, changes in subsurface pressure from geologic sequestration have the potential to cause fracturing or reopening of faults and fracture zones.

Relationship to Project: Potential impacts related to seismic activities are addressed in the Initial Study (Section 3.6 Geology and Soils).

Mitigation and Monitoring

Relationship to Project: Because the volume injected is small, the site is remote from sensitive receptors, and the injection point is over 2 miles deep, the NCCRP results in low vulnerability. Adverse impacts are not expected. Therefore, no mitigation measures would be required.

Monitoring will be a key aspect of the project. Data would be collected on how CO₂ behaves within the formation and on the nature of the geology and its characteristics. Baseline data collection would be performed to evaluate the composition, physical properties, pressure and temperature of native fluids found in the saline formation and near-surface groundwater. Baseline measurements would be compared to data collected during and after CO₂ injection to look for changes in geochemistry, hydrochemistry, and fluid pressures, indicating potential leakage from the target injection formation into overlying formations. Monitoring would be on-going during and after the injection and a post-injection geophysics evaluation is expected to be performed. Attachment P Monitoring Program of the UIC permit application provides additional monitoring details.



C6 Resources LLC
200 N. Dairy Ashford Dr.
P.O. Box 576
Houston TX 77001-0576
Direct line: (281) 544-4972

February 18, 2010

Ms. Nedzlene Ferrario
Solano County Planning Services Division
Dept. of Resource Management
674 Texas Street, Suite 5500
Fairfield, California 94533

Subject: Transmittal of Northern California CO₂ Reduction Project Permit Application Incompleteness Response

Dear Ms. Ferrario:

C6 Resources LLC, an affiliate of Shell Oil Company, is pleased to provide five copies of our response to **Solano County's December 11, 2009 correspondence** (see Attachment 1) that cited four areas in which our application (APN: 0090-090-280) to drill a Class V injection well for carbon sequestration was deemed incomplete. We understand that in order to complete our application, additional information in the following areas is required: seismicity, noise, grading, and closure and restoration of the site. Please find in Attachments 2 through 5, the requested information for each of the above-mentioned areas.

If there should be a need for additional information, or if there are any questions, please contact DaMonica Pierson, at 832-337-2172 or email damonica.pierson@Shell.com.

Sincerely,

A handwritten signature in black ink, which appears to read "Edward Hymes", is located below the "Sincerely," text.

C6 Resources LLC
Edward Hymes
President

cc w/attachments

Mr. Adam Freedman
Environmental Scientist
US EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

ATTACHMENT 1
December 11, 2009 Incompleteness Letter from Solano County

ATTACHMENT 2
Seismic Study



Department of Resource Management
675 Texas Street, Suite 5500
Fairfield, California 94533
www.solanocounty.com

Planning Services Division
(707) 784-6765 Fax (707) 784-4805

Mike Yankovich
Program Manager

December 11, 2009

Mr. Wayne Hamilton
C6 Resources, LLC
150 N. Dairy Ashford
Houston, TX 77079

Dear Mr. Hamilton:

On November 13, 2009, this department received your application proposing to drill a Class V injection well for carbon sequestration on property located at 6378 Montezuma Hills Road (APN: 0090-090-280). As required by section 65943 of the Government Code, you are hereby advised that the referenced application has been reviewed and found to be incomplete. In order to complete your application, the following information should be submitted.

- 1) A seismic study, as outlined in the attached memo from the Environmental Health Division, dated September 21, 2009, and as further clarified at our meeting on November 13, 2009.
- 2) An analysis of the noise impacts from trucks, particularly during the night, to the residents along Birds Landing Road (haul route). Based on 2004 aerial imagery, it appears that there are at least nine houses along this stretch of Birds Landing Road, set back in the range of 35 feet to 550 feet from the road. What will be the decibel level generated by these trucks, as perceived from the interior of the houses along this route? What measures could be implemented by the truck drivers in order to mitigate these intermittent noise impacts?
- 3) A revised site plan, showing a maximum 2:1 slope on all cuts, fills, and stockpiled soil to minimize the potential for erosion.
- 4) A cost estimate for closure and restoration of the site, along with a timeline for completion of this process (assuming the commercial project does not go forward).

Your application will be held as incomplete pending receipt of the information requested above. Your prompt response will greatly facilitate our department's processing of your application. During the course of consideration of the application, it may be necessary to ask you to clarify or provide additional information. We will contact you if this becomes

necessary. Once the application has been deemed complete, we will determine the appropriate level of environmental review for the proposed development. If you have any questions, please do not hesitate to call me at (707) 784-3154.

Sincerely,

Michael E. Profant

Michael E. Profant
Assistant Planner

Cc: Jim Leland

Dana Dean
835 First Street
Benicia, CA 94510

Encl: Environmental Health memo

Seismic Study

Shell's approach to risk management is a multi-step process, and addressing your question about induced seismicity is following a similar process. We have gathered additional technical information, reviewed available literature, and done further analysis to address your questions about the possibility for induced seismicity. As you know, there is a lack of existing oil and gas fields at Montezuma Hills, and therefore a lack of drilled wells. While this is one of the reasons for the selection of Montezuma Hills (the reduction of the risk of leakage of CO₂ to the surface) it also limits our knowledge of key parameters which would allow a more detailed assessment of the probability of seismicity induced by the injection of CO₂. It is worth noting that our application is for a small-scale project and that a fundamental goal of the small-scale project is to gather additional data in the immediate area in order to assess this aspect of the feasibility of a larger-scale project, if any, in the future. As such, we anticipate a more detailed seismic study would be available after small-scale project is completed.

In order to complete such seismic study we need more information at the proposed well location and how it relates to the existing faults in this vicinity. In particular, we plan to acquire information on the present day stress state, an extensive suite of well logs and core data, and additional evaluations of the fault locations and their characteristics. All of these data will allow additional laboratory analysis and model updates. Much of this information can only be obtained by careful measurements that are made in the appraisal well itself, prior to any CO₂ injection.

The EPA permitting process for the appraisal well requires that EPA review the resulting data before granting the injection permit for CO₂ for the small-scale project. Although our current assessment based on work done for site selection is that the risk of inducing earthquakes >M3 is very low, this estimate will be updated and refined for review by the EPA prior to CO₂ injection. Our intention is to keep Solano County informed at all steps of this process to ensure that you are in possession of all the data as we develop and submit it to the EPA.

ATTACHMENT 3
Noise Analysis

Noise Analysis

Solano County Comment:

2) *"An analysis of the noise impacts from trucks, particularly during the night, to the residents along Birds Landing Road (haul route). Based on 2004 aerial imagery, it appears that there are at least nine houses along this stretch of Birds Landing Road, set back in the range of 35 feet to 550 feet from the road. What will be the decibel level generated by these trucks, as perceived from the interior of the houses along this route? What measures could be implemented by the truck drivers in order to mitigate these intermittent noise impacts?"*

Response:

The Solano County Public Health and Safety element of the General Plan has Land Use Compatibility Standards of 45 dBA CNEL¹ for the interiors of residential uses. Because of the noise barrier provided by building walls and windows, the rule of thumb is that the interior of residences will be about 15 dBA lower than the noise outside the residence.² Based on this difference, exterior noises of 55 to 60 dBA would be 40 to 45 dBA inside the residence. Stated another way, exterior noise of 60 dBA would meet the General Plan objective of 45 dBA for interior noise levels in residential uses.³

Gravel trucks associated with the project would cause increased interior noise for any residence along the access route, especially the closest at 35 feet from the lanes. Trucks delivering gravel would operate during the daytime for approximately one week during the construction phase of the project. The highest single hour noise levels from these trucks, traveling 40 miles per hour, would be about 60 dBA at the exterior of a building located 35 feet from the source. Taking into account the shielding provided by walls and windows, this would cause a daytime noise level of about 45 dBA in the interior of the residence. Since gravel delivery would be a daytime activity, this activity would not affect nighttime noise levels. Nighttime noise levels would remain as they are in the existing conditions, which due to the rural setting are assumed to be consistent with the General Plan objective of less than 45 dBA CNEL for residential uses.

Daily CO₂ delivery trucks making 10 visits, or 20 pass-bys, would result in an interior CNEL of 43 dBA for the closest residence. Trucks delivering CO₂ would generate a

¹ The Community Noise Equivalent Level (CNEL) metric is a weighted measurement of sound levels gathered throughout a 24-hour period.

² The U.S. Department of Housing and Urban Development, Noise Guidebook, notes that with "standard construction" any building will provide sufficient attenuation to achieve a 20 dB reduction, but 15 dB is used here recognizing construction quality varies widely. A typical range of noise reduction provided by residential dwellings (12 to 18 dB with windows partially open) is identified in the California Governor's Office of Planning and Research, General Plan Guidelines (2003).

³ CNEL is a measurement used for day and night environmental noise, where a penalty of 10 dBA is added to sound occurring between 10 p.m. and 7 a.m. and a penalty of 5 dBA is added to sound occurring between 7 p.m. and 10 p.m. This recognizes that community members are most sensitive to noise in late night hours and are more sensitive during evening hours than in daytime hours. CNEL accounts for all individual noise events during the 24-hour period by aggregating the individual sound levels and reporting the noise over an equivalent 24-hour period.

similar individual noise level as gravel trucks, but a lower hourly noise level of about 52 dBA occurs because fewer truck visits would be needed for any one hour. CO₂ is expected to be delivered around the clock, at the rate of about ten round trips per 24-hour day. This would be 20 truck passes of a point per day – or about one per hour. For nighttime noise, which is more disruptive of sleep and evening/morning activities, a penalty of 5 to 10 dBA is added to all evening and nighttime truck traffic, consistent with the CNEL metric. Including that penalty results in 58 dBA CNEL for the exterior noise level or 43 dBA CNEL for the CO₂ delivery traffic, which would be consistent with the General Plan objective.

Based on the noise levels for day and night, no mitigation would be required.

Daytime and Day-Night Traffic Noise Levels, Including Heavy Truck Traffic

Phase	Heavy Duty Truck Pass-bys (per average hour)	Exterior Noise Level at 35 feet (dBA Leq-hourly)	Heavy Duty Truck Pass-bys (per day)	Exterior Noise Level at 35 feet (dBA CNEL)	Interior Noise Level at 35 feet (dBA CNEL)
Gravel Delivery	7	60	72 (10-hr workday)	< 60	< 45
CO ₂ Delivery	< 1	52	20 (24-hr workday)	58	43

Source: Noise level calculations, including all vehicle classes, dominated by heavy-duty trucks at 40 mph, based on Reference Energy Mean Emission Levels (REMELS) for California Vehicle Noise, published by Caltrans in the Technical Noise Supplement (11/09): Figure 5-9.

ATTACHMENT 4
Revised Site Plan/Grading Drawings

ATTACHMENT 5
Cost Estimate for Closure and Restoration of the Site

Cost Estimate for Closure and Restoration of the Pilot Study Site

The following scope of work would be initiated at the direction of the C6 Project Team and take place over a minimum of 30 days.

Budget Breakdown

Description	Man Hours	KSI LABOR	KSI EQUIPMENT	KSI Material	SUB CONTRACTORS	TOTALS
Mobilization/Demobilization	120	\$4,320.00	\$8,990.00			\$13,310.0
Supervision / Safety	180	\$14,820.00	\$2,430.00			\$17,250.0
Removal & Stock Top Soil	120	\$4,411.00	\$10,390.00			\$17,801.0
Building of Location	370	\$18,805.00	\$32,685.00			\$51,490.0
Grade Road	80	\$4,835.00	\$6,390.00			\$11,225.0
Install Base on Road & Location	150	\$8,265.00	\$9,135.00	\$99,290.00	\$63,950.00	\$180,640.0
Soil & Compaction Testing					\$15,000.00	\$15,000.0
Reclaim Location	420	\$23,520.00	\$37,390.00			\$60,910.0
Surveying & Mapping					\$25,850.00	\$25,850.0
Trucking Water for Drilling						
Trucking of Drilling Mud						
Fencing and Gates					\$12,500.00	\$12,500.0
Electrical Underground						
						\$405,976.0